

Computational thinking issues

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ABSTRACT

This is the second occasion that Computational Thinking track is presented in TEEM Conference. Our Society is claiming for more technical professionals and future job will need workers know the computational principles to be applied in their daily tasks, independently they will be technicians. The computer science and programming skills need to be introduced since early beginning in the children education, but these are not enough, a new way of thinking and solving problems is needed, this is the computational thinking goal.

CCS CONCEPTS

- Social and professional topics → Computational thinking
- Social and professional topics → K-12 education

KEYWORDS

Computational Thinking; Coding in schools; Computational thinking skills and curriculum; Programming robots; Controlling things; Using logic; Coding skills throughout games; TACCLE 3.

1 INTRODUCTION

In our society, there exists an increasing demand of positions related to technology and scientific knowledge, particularly Engineering, because of we are living in a software-driven society [1].

New devices [2-4], from smartphones and tablets to electronic learning toys and robots, find new audiences with increasingly young children [5, 6]. This causes new challenges for teachers [7-9], for example how to define developmentally appropriate activities and content for children of different ages [10].

Our Society is claiming for more technical professionals and future job will need workers know the computational principles to be applied in their daily tasks, independently they will be technicians., for example, in the European Union more than 800,000 professionals skilled in computing/informatics by 2020 are expected. Many educators, parents, economists and politicians are starting to think that students need some computing and coding skills [11]. The computer science and programming skills need to be introduced since early beginning in the children education [12-14], but these are not enough, a new way of thinking and solving problems is needed, this is the computational thinking goal [15-18].

Several countries have usually adopted several priorities for developing ICT competences from kindergarten to secondary education. In other countries, many experiences are being developed till teachers, students and families are waiting for an official solution for these issues [19, 20].

One of these initiatives is TACCLE 3 – Coding European Project [21-24], which is focused on supporting school teachers and developing their confidence to deliver the new computing curriculum including coding and computational thinking approaches.

In collaboration with TACCLE 3 project, in the last edition of TEEM Conference [25], we started to run a Computational Thinking track [26] with a significant success in the quality of the papers and in the generated debate. For this reason, we have organized again a Computational Thinking track with 9 very interesting contributions.

2 PAPERS IN THE TRACK

Now, the accepted papers will be briefly presented.

2.1 A first proposal of Pedagogic Conversational Agents to develop Computational Thinking in children

Morales Urrutia [27] make an initial proposal to use of Pedagogic Conversational Agents to develop computational thinking in children. Given the complexity of designing this new type of agent, and as it has been done in previous occasions when trying to design a new agent, the MEDIE methodology [28] will be followed to eventually integrate the agent into the classrooms.

2.2 Improving Computational Thinking Using Follow and Give Instructions

Figueiredo and García-Peñalvo [29] try to demonstrate the importance of computational thinking in the first beginning of learning programming, and what activities best contribute to increase the abilities of each computer engineering student in computational thinking according to the characteristics of those who attend the Polytechnic of Guarda, Portugal.

2.3 Bringing computational thinking to teachers' training: a workshop review

Dodero et al. [30] describe a workshop for teachers' training on Computational Thinking based on the block-based common language of Scratch [31], but focused on enhancing teachers' skills to develop mobile applications with a tool based on the MIT's AppInventor [32]. This workshop provided some insights on the capabilities of future teachers in the use of programming tools.

2.4 Development of computational thinking and collaborative learning in kindergarten using programmable educational robots: A teacher training experience

Caballero González and García-Valcárcel Muñoz-Repiso [33] show some advances of a study that is oriented to the development of programming abilities, computational thinking and collaborative learning in an educational context of initial education. One of the actions carried out was the training of teachers who will participate in the experimental phase; considering this human resource as a link of great importance to achieve a maximum use of the students in the development of the curricular themes of the level, using ICT resources and programmable educational robots.

2.5 Promoting computational thinking and creativeness in primary school children

Chiassese et al. [34] presents the preliminary results of the project "Computational Thinking for children education", aimed at promoting computational thinking, creativity and learning amongst primary school children.

2.6 Promoting Computational Thinking in K-12 students by applying unplugged methods and robotics

Conde et al. [35] present an experiment to promote computational thinking by using unplugged methods [36] and employing robots as teachers as an engagement factor for the students. During the experiment, they have been distributed in two groups. One has carried out unplugged activities to develop computational thinking while the other did not. From the experiment, it is possible to see that results are better for those students that have completed unplugged activities and there are differences depending on age.

2.7 A (Relatively) Unsatisfactory Experience of Use of Scratch in CS1

Martínez-Valdés et al. [37] have adopted Scratch as the introductory programming language for a CS1 course in a videogames major. It was used for two weeks and then the course switched to using Java. The results we obtained for both the Scratch language and the Dr. Scratch tool were less satisfactory than expected and, in some regards, disappointing. They describe their experience, analyze students' acceptance and discuss some consequences and lessons learnt to Scratch in university courses.

2.8 Personalized education using computational thinking and b-learning environment: Classroom intervention

Rojas and García-Peñalvo [38] tackle the problem of the dropout percentages, accreditation and average grade of students that study university courses of Methodology of programming and Programming of first and second semester of career of Information and Communication Technologies in the Technological University of Puebla. This study shows the results of interventions carried out in front of a group of educational strategies that allowed to have better percentages in comparison with those obtained in the last 8 years.

2.9 Trastea.club, an initiative to develop computational thinking among young students

Guenaga et al. [39] present Trastea.club, an initiative to help schools in their constant adaptation processes towards the new digital literacy.

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